

REMARKS

In response to the above Office Action and the rejection of claim 8 under 35 U.S.C. §112, second paragraph as well as the objection to claim 9, these claims have been amended to more clearly claim the ranges of X. X means the atomic ratio of Mo and Sn (Mo/Mo+Sn). Therefore, X must be 0 or more and cannot exceed 1. Consequently, it would be obvious that X varies between 0 and 1. However, according to claims 8 and 9, X cannot be either 0.29 or 0.51.

In the Office Action, the Examiner rejected claims 1-3, 5-7, and 11-15 under 35 U.S.C. §103(a) for being obvious over GB 1 324 717, hereafter GB'717, in view of EP 0 614 872, hereafter EP'872. Claims 8-10 were rejected for being obvious over GB'717 in view of EP'872, further in view of U.S. Patent No. 3,636,156 to Ozaki et al., hereafter Ozaki

(1) The Present Invention

One of the most important advantages of the present invention is that the method can suppress the formation of carbonaceous substances on a catalyst and noticeably increase the selectivity of a desired product by using a catalyst on which the amount of the carbonaceous substances accumulated on it has been controlled to be within a specific range in a reaction for producing an alcohol and/or a ketone [for example, methylethylketone (MEK)] from an alkene. Use of a catalyst on which a specific amount of the carbonaceous substances accumulated on it is purposely left without completely removing the carbonaceous substances increases the selectivity of the desired product and maintains the productivity of the desired product (see page 19, line 7 to page 20, line 11 of the present specification).

The present invention provides excellent selectivity of the desired product and maintenance of the productivity thereof by controlling the amount of the carbonaceous substances accumulated on the catalyst to be reused in the reaction to be within a range of 0.1 to 10 wt% and eventually controlling the amount of the carbonaceous substances on the catalyst in a reactor to be within the same range (see page 16, lines 12 to 28 of the specification).

The unexpectedly advantageous effects achieved by the claimed method are demonstrated in the examples of the present specification. For example, Example 1 is representative of the claimed method. The Example has carbonaceous substances on the catalyst of 3.5 mass%. It exhibits a selectivity to desirable MEK of 86% and a selectivity to undesirable carbonaceous substances of 10%. In contrast, Comparative Example 1 differs from Example 1 in having a smaller amount of carbonaceous substances on the catalyst of 0.03 mass%. The Comparative Example exhibits a selectivity to MEK of only 50% and a selectivity to carbonaceous substances of as high as 46%. Comparison of Example 1 with Comparative Example 1 clearly reveals that the claimed method shows unexpectedly superior results.

(2) Prior Art

GB'717 teaches a process for preparing ketones (e.g., acetone or butanone) from olefins (e.g., propylene or butene), where olefins are converted over a catalyst of molybdenum oxide together with tin oxide, and where the catalyst is regenerated in the presence of an oxygen-containing gas. The catalyst employed in the reference circulates between a reaction zone and a regeneration zone.

EP'872 teaches the removal of organic matters from an oxidation catalyst of molybdenum oxide and another metal oxide, and also a method of regenerating the oxidation catalyst by mixing steam and an oxygen-containing gas in the presence of the catalyst. In the reference, the mixing is conducted at temperatures of from 260 to 450°C, where the molar ratio of oxygen in the mixed gas is at least 3 vol%.

Ozaki teaches a process for the production of ketones from olefins in the presence of an oxide catalyst of molybdenum oxide and another metal oxide (s) such as tin oxide, where the proportion of molybdenum oxide to the other metal oxide(s) is adjusted so that the ratio of molybdenum atom to the other metal atoms is 0.005 to 0.5.

(3) The Difference Between the Present Invention and The Prior Art

As described above, the present invention is characterized in that the formation of the carbonaceous substances on the catalyst can be suppressed by using a catalyst on which an amount of the carbonaceous substances accumulated on it has been controlled so as to be within a specific range in a reaction for producing an alcohol and/or ketone from a corresponding alkene. In other words, use of a catalyst on which a specific amount of the carbonaceous substances is purposely left without completely removing it noticeably increases the selectivity of the desired product.

Thus, the present invention is based on the surprising discovery of a pronounced effect, unpredicted by a person skilled in the art, that can be obtained by purposely not completely removing all of the carbonaceous substances and by leaving a specific amount of the carbonaceous substances on the catalyst at the time of the regeneration treatment.

In contrast, none of the references disclose or suggest leaving a specific amount of the carbonaceous substances on the catalyst or the effect that can be obtained by purposely doing so. In other words, by not completely removing the carbonaceous substances.

The Examiner acknowledges that GB'717 does not mention the formation of carbonaceous substances on the catalyst or to what degree the substances should be controlled. EP'872 may teach removal of such substances from an oxidation catalyst, but it describes at page 2, lines 30 to 31 that ". . . when solid organic matters are formed and deposited on the oxidizing catalyst, the catalytic activity lowers, and the yield of the desired unsaturated carboxylic acid lowers." The reference also describes at page 2, lines 48-50 that "Another object of this invention is to provide a process to regenerate an oxidizing catalyst whose catalytic activity was lowered by solid organic matters formed and deposited on the oxidizing agent, by removing the solid organic matters safely and efficiently."

Accordingly, there is a prejudice in EP'872 that the existence of the solid organic matters will reduce the activity of the catalyst and the yield of the desired product and that the solid organic matters should be removed. This is directly opposite to the present invention where control of the amount of the accumulated carbonaceous substances provides the beneficial effects described above.

In summary, EP'872 does not even suggest the present invention and, in fact, teaches away from it.

Additionally, the regeneration conditions of the catalyst (Temperature; 260 to 450°C, Oxygen concentration; 3 vol% or more) disclosed in EP'872 are not far from the

regeneration conditions disclosed in the present invention (Temperature; 270 to 550°C, Oxygen Concentration; 10 vol. ppm to 21 vol% as described in claim 5 and at page 17, lines 9 to 14 of the specification). The present invention discloses that the retention time for regenerating the catalyst is within a range of from 10 seconds to 10 hours so as to retain an amount of the carbonaceous substances within the specific range claimed. EP'872 does not define a treatment time, but it carries out a regeneration treatment for a much more longer period of time within a range of 20 to 40 hours according to the Examples. Such a treatment for such a long time would remove completely all of the solid organic matters (carbonaceous substances) accumulated on the catalyst.

Thus the method of EP'872 for regenerating the catalyst completely removes the solid organic matters (carbonaceous substances) accumulated on the catalyst.

Hence, even if GB'717, which does not disclose any method for controlling the carbonaceous substances, is combined with EP'872, a person skilled in the art would not conceive the present invention from this combination. It is impossible from these references for one to come up with the idea of leaving an amount of the accumulated carbonaceous substances on the catalyst within the specific range claimed.

Accordingly, it is submitted that claim 1 or claims 2, 3, 5-7, and 11-15 dependent therefrom cannot be considered obvious over the combination of GB'717 and EP'872. Its withdrawal as a ground of rejection of these claims is, therefore, requested.

Similarly, it is believed claims 8-10 are not obvious over this combination in view of Ozaki, because Ozaki does not teach anything about controlling the amount of carbonaceous substances on the catalyst let alone within the range claimed, and these claims all depend from claim 1. They are, therefore, patentable on the cited

combination of references for the same reasons expressed above with respect to claim 1. Withdrawal of the rejection of claims 8-10 over GB'717 in view of EP'872 and Ozaki is, therefore, also requested.

It is believed claims 1-3 and 5-15 are in condition for allowance.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account 06-0916.

Respectfully submitted,

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